Introduction:
Lifelong learning (LLL) aims to learn successively a series of tasks from their corresponding probabilistic representations of specific databases.

The drawback of GRMn:
1. The old dataset can not approximate the corresponding training dataset exactly.
2. Generating a old dataset requires an extra memory.

One solution is to expand the network architecture where the shared module is fixed after the first task learning.

Lifelong infinite mixture model (LIMix):
The network architecture of LIMix when training the K-th component at a certain task learning. Red colour represents the activated modules.

Step 1. We first collect a group of samples from the new task.
Step 2. We calculate the difference on log-likelihood of these collected samples.
Step 3. We calculate the expert index for each sample.
Step 4. We calculate the expert index for the new task.
Step 5. We perform the selection or expansion.

Experiment:
We train various models under lifelong learning of MNIST, SVHN, Fashion, IFashion, RMNIST and CIFAR10.

Conclusion:
- We propose a new theoretical analysis framework for lifelong learning based on the discrepancy distance between the probabilistic measures of the knowledge generated by the model and the target distribution.
- Inspired by the analysis, we propose LIMix which performs better in cross-domain lifelong learning.